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10/644,567	08/20/2003	Scott G. Walton	84613-US1	6607

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EXAMINER	
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ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/644,567	WALTON ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 12-23* is/are pending in the application.

4a) Of the above claim(s) *16-21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-15,22 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Prosecution is re-opened based Applicant's request filed February 14, 2008 and based on the new ground of rejections presented in the Examiner's Answer of December 14, 2007.

Claim Construction - 35 U.S.C. 112 6th paragraph

At the outset the examiner has determined that means-plus-function language exists in claim 1 and 35 U.S.C. 112 sixth paragraph is applicable.

1) Claim 1, line 5, "magnetic means for confining....."

2) Claim 1, line 9, "sputtering means"

3) Claim 1, line 10, "vaporization means"

For 1) the magnetic means structure is defined on page 7 lines 6-7 and with Fig. 1 item 4. The magnetic means structure is well known in the art and a magnetic coil or permanent magnet would serve as the structure. Fig. 1 of the prior art to Meger relied on in the rejection below show a field coil to produce a magnetic field.

For 2) the sputtering means structure is defined on page 2 lines 6-17 and page 6 line 7.

For 3) the vaporization means structure is defined on page 6 lines 7-8.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, 7-9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. "Beam-generated plasmas for processing applications", Physics of plasmas, Volume 8, Number 5 May 2001, pp. 2558-2564 in view of Moseson (U.S. Pat. 3,393,142) AND Bunshah "Handbook of Deposition Technologies for Films and Coatings", pp. 325, 345 1994 OR Manheimer et al. "Theoretical overview of the large-area plasma processing system (LAPPS)", Plasma Sources Sci. Technol. 9 (2000) pp. 370-386.

Regarding claim 1, Meger et al. teach a plasma system. (See Abstract) The plasma system has an electron beam source that has a width much larger than its thickness. i.e. A thin (about 2 cm) sheet plasma with a large area (i.e. width). (See Page 2563) The average electron energy is from 1-5 KeV. (See Abstract) A gas is provided such as argon, nitrogen, or oxygen. A pair of Helmholtz field coils confines the beam. (Page 2559) The temperature of the plasma can be 1 eV. (See Abstract) As to the "capability" of the apparatus working in 10 mTorr of oxygen since the electron beam

is produced in the same apparatus with the same characteristics as required by Applicant's electron beam it is believed the that electron beam source apparatus is "capable" of operating at 10 mTorr of oxygen.

Regarding claim 8, the electron beam source is a linear hollow cathode beam source. (See Fig. 1B)

Regarding claim 9, argon, nitrogen or oxygen can be used. (See page 2559)

Regarding claim 15, the plasma sheet can be 60 x 60 cm^2. (See Abstract)

The difference between Merger et al. and the present claims is that the use of a sputtering target is not discussed (Claims 1, 2), the large area plasma beam being used for sputtering is not discussed (Claim 1), locating a substrate for deposition on is not discussed (Claims 3), the source being select from metals, alloys, semiconductors, or non-conducting materials (claim 7).

With regard to Applicant's claim 1, Moseson teach an apparatus for establishing an ion plasma adjacent an ion target for sputtering of the ion target to form films on a substrate. (Column 1 lines 60-64) With regard to Applicant's claim 1 and considering Figure 4 of Moseson, the apparatus can comprise an electron beam source comprised of a filament 41 guided by a tubular member 32 into the interior of an adaptor 184, which rests on the plate 50. The adaptor 184 has a nozzle 185, which extends in the direction of an anode 181. The tubular member 32 and the adaptor 184 jointly operate to provide a stream of electrons, which issues through the nozzle 185 in a direction substantially parallel to the plate 50. (Column 6 lines 36-43) The configurations of the adaptor 184 and the nozzle 185 are best apparent from Fig. 5 of the drawings. From

this figure it will be recognized that the nozzle 185 defines a rectangular aperture 187, which is similar to the previously described aperture 155 shown in Fig. 3. Dotted lines in Fig. 5 indicate the configuration on anode 181. This anode configuration corresponds to the configuration of the aperture 87, so that an approximately prismatic ion plasma will be formed between the nozzle 185 and the anode 181 in the absence of a magnetic field. Dotted lines 188 in Fig. 4 are intended to outline this ion sheet. (Column 6 lines 44-55) The apparatus shown in Figs. 4 and 5 has the advantage that the ion plasma sheet is in a horizontal plane. (Column 6 lines 72-74) From Fig. 5 the width of the electrons beam is much large than it's thickness. (See Fig. 5) Considering Figure 4 of Moseson, the plasma sheet exists in the horizontal plane (Column 6 lines 72-74) produced form the electrons and has a width, thickness and length as seen and suggested in Figs. 4 and 5. (See Figures 4 and 5) Considering Figure 4 of Moseson, an electromagnetic coil 193 is positioned to establish parallel field lines and control the plasma and thus the sputtered film density on the substrate. The coil 193 may be movable (Column 6 lines 69-71) in order to effect the uniformity of film thickness on the substrate surface. (Column 4 lines 65-68) The plasma is in a horizontally sheet. (Column 6 lines 72-73) Considering Fig. 4 of Moseson, an ion target 95 is present for depositing a film of coatings on substrates. (Column 6 lines 56-62) Considering Fig. 4 of Moseson, a substrate 190 is present for deposition upon. (Column 6 lines 59-62)

With regards to Applicant's claim 2, the target 95 is connected to battery 102 in order to provide the bias in order to attract ions out of the plasma sheet for sputtering. (Column 6 lines 18-35; Column 6 lines 56-62)

With regard to using the large area plasma for sputtering of Applicant's claim 1, Moseson already establish sputtering of a target by a sheet plasma. (See Moseson discussed above) Furthermore, the phrase "plasma for processing applications" of Meger is construed to include numerous processing embodiments. Further evidence that "plasma for processing applications" is a term of art is readily available from handbooks such as Bunshah which mentions that "processing plasma is a plasma that is used in materials processing" and that such "plasmas for processing" are used in sputtering. OR as suggested by Manheimer et al. large area plasmas can be used for deposition. As shown by Moseson sputtering is a form of deposition. (Bunshah pages 325, 345 or Manheimer et al. page 370)

With regards to Applicant's claim 3, the electrical bias is DC bias as shown schematically in Fig. 4. (See Figure 4)

With regards to Applicant's claim 7, the Moseson recognize that metallic elements and many alloys have been sputtered in the prior art (Column 1 lines 24-27) and their invention provides an apparatus for depositing those thin film materials. (Column 1 lines 53-56) A target is used for depositing the films. (Column 6 lines 56-62)

The motivation for utilizing a sputtering target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for deposition in an electron beam apparatus is that it allows for reducing the energy requirements of sputtering operations. (Column 1 lines 50-53)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Meger et al. by utilizing a sputtering

target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for deposition as taught by Moseson and to have utilized the features of Bunshah OR Manheimer et al. because it allows for performing sputtering operations.

Claims 4, 5, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson and Bunshah OR Manheimer et al. as applied to claims 1-3, 7-9 and 15 above, and further in view of Oda et al. (U.S. Pat. 3,436,332).

The differences not yet discussed are the substrate being electrically biased is not discussed (claim 4), the electrical bias being DC or RF is not discussed (claim 5) and where the target and the substrate are biased (claim 10).

Oda et al. teach biasing the substrate. The substrate can be biased by a DC electric source or an AC electric source. (Column 3 lines 11-18) Oda et al. further suggest that the target be sputtered by applying a bias voltage as well. (Column 2lines 70-72; Column 3 lines 1-5)

The motivation for biasing the substrate and utilizing DC or RF sources to bias the substrate is that it prevents electrons from entering the electron guide tube 16. (Column 3 lines 15-18)

The motivation for biasing both the substrate and the target is that it allows for deposition of films. (Column 3 line 5)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have biased the substrate, utilized DC or RF sources to bias the substrate and to have biased both the substrate and the target as taught by

Oda et al. because it allows for preventing electrons form entering the electron guide tube and for depositing films.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson and Bunshah OR Manheimer et al. as applied to claims 1-3, 7-9 and 15 above, and further in view of Hurwitt et al. (U.S. Pat. 6,416,635).

The differences not yet discussed is the target and the substrate being adjustable is not discussed (claim 6) and a sputtering magnetron being utilized is not discussed (Claim 12).

With regard to Applicant's claim 6, Hurwitt et al. teach that either the target or the substrate can be moved relatively to one another. (Column 5 lines 47-53) Also, Moseson suggest adjusting the beam position by moving the magnet field. (See Moseson discussed above)

The motivation for moving the target and the substrate relative to one another is that it allows for improving uniformity. (Column 6 lines 3-8)

With regard to Applicant's claim 12, Hurwitt et al. teach that a magnet assembly can be utilized behind the target for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

The motivation for utilizing a magnetron is that it allows for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have moved the substrate and target relative to one another and to have utilized a magnetron for confining and enhancing the plasma during

sputtering as taught by Hurwitt et al. because it allows for forming uniform films and for confining and enhancing the plasma during sputtering.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson and Bunshah OR Manheimer et al. as applied to claims 1-3, 7-9 and 15 above, and further in view of Bunshah et al. (U.S. Pat. 4,336,277).

The differences not yet discussed are utilizing a vaporization means is not discussed (claim 13) and positioning the electron beam produced plasma between the source material and the substrate is not discussed (claim 14).

With regard to claims 13 and 14, Bunshah et al. suggest placing a vaporization means in a chamber opposite substrates with an electron beam means positioned between the vaporization means and the substrates. (See Figure; Column 3 lines 25-27; Column 56-68)

The motivation for utilizing a vaporization means and locating the electron beam between the source and the substrate is that it allows for producing high quality coatings. (Column 1 lines 35-36)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a vaporization means and positioned the electron beam produced plasma between the source material and the substrate as taught by Bunshah et al. because it allows for producing high quality coatings.

Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson and Bunshah OR Manheimer et al. as applied to

claims 1-3, 7-9 and 15 above, and further in view of Fernsler et al. "Production of large-area plasmas by electron beams", Physics of Plasmas, Volume 5, Number 5, pp. 2137-2143, May 1998.

The differences not yet discussed is wherein the width of the electron beam is at least 30 times the thickness of the electron beam is not discussed (Claim 22) and wherein the width of the electron beam is from 30 to 100 times the thickness of the electron beam is not discussed (Claim 23).

Regarding claims 22, 23, Meger et al. discussed above teach beams of 60 cm wide. The thickness of the beams can be 2 cm. (Pages 2559, 2563) Fernsler et al. teach beams of 60 cm wide and thickness of the beams can be 2 cm. (See Fernsler et al. Abstract)

The motivation for utilizing the features of Fernsler et al. is that it allows for producing plasmas for applications requiring large areas. (see page 2137)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Meger et al. and Fernsler et al. because it allows for producing plasmas for applications requiring large areas.

Response to Arguments

Applicant's arguments filed February 14, 2008 have been fully considered but they are not persuasive.

The 35 U.S.C. 112 rejection:

The 35 U.S.C. 112 rejection has been withdrawn because of the amendments made by Applicant.

The 35 U.S.C. 103 rejections:

Response to the arguments for claims 1-3, 7-9 and 15 rejected as obvious over Meger et al. in view of Moseson:

In response to the argument that there is no motivation for combining Moseson with Meger et al. because Moseson teaches the desirability of reducing the energy requirements of sputtering operations while Meger et al. shows utilizing increased energy for operation, it is argued that there is motivation to combine because Moseson establish that a sputtering target or source is utilizable in an apparatus where an electron beam is used to generate a plasma for performing a sputtering process and will produce quality films. Furthermore, Meger et al. teach an electron beam for generating the plasma and suggest utilizing the ***"plasma for processing applications"***. Therefore when considering the teachings of Moseson in which a sputtering ***"process"*** is performed it would be obvious to one of ordinary skill in the art to modify Meger et al. by placing a sputtering target in Meger et al.'s apparatus since ***"processing"*** is what is required to take place in their apparatus. (See Meger et al. and Moseson discussed above)

In response to the argument that there is nothing in the references that suggests utilizing a magnetic field for large area plasma sputtering, it is argued that the primary reference to Meger teach utilizing a magnetic means to form a large plasma. Furthermore, Meger et al. teach an electron beam for generating the plasma and suggest utilizing the ***"plasma for processing applications"***. Therefore when considering the teachings of Moseson in which a sputtering ***"process"*** is performed it

would be obvious to one of ordinary skill in the art to modify Meger et al. by placing a sputtering target in Meger et al.'s apparatus since ***"processing"*** is what is required to take place in their apparatus. (See Meger et al. and Moseson discussed above) Furthermore, Meger suggest the phrase ***"plasma for processing applications"*** and that is construable to include sputtering and other methods (i.e. etching) and is a term of art construed to include numerous processing embodiments. Further evidence that ***"plasma for processing applications"*** is a term of art is readily available in Handbooks such as "Handbook of Deposition Technologies for Films and Coatings" from Noyes Publications which mentions that ***"processing plasma is a plasma that is used in materials processing"*** and that such ***"plasmas for processing"*** are used in sputtering. Furthermore, Manheimer et al. suggest large area plasma can be used for deposition and deposition includes sputtering. (See Moseson, Meger et al. and Manheimer et al. discussed above)

In response to the argument that the phrase ***"plasma for processing applications"*** in Meger would not suggest sputtering and is merely speculative, it is argued as discussed above that sputtering can be considered to be a plasma ***"process"*** and thus is suggestive of a ***"plasma processing applications"***. This evidenced by the teachings of Moseson which show the sputtering plasma process application. Furthermore, the phrase ***"plasma for processing applications"*** is construable to include sputtering and other methods (i.e. etching) and is a term of art construed to include numerous processing embodiments. Further evidence that ***"plasma for processing applications"*** is a term of art is readily available in

Handbooks such as "Handbook of Deposition Technologies for Films and Coatings" from Noyes Publications which mentions that ***"processing plasma is a plasma that is used in materials processing"*** and that such ***"plasmas for processing"*** are used in sputtering. Furthermore, Manheimer et al. suggest large area plasma can be deposition and deposition includes sputtering. (See Moseson, Meger et al. and Manheimer et al. discussed above)

Response to the arguments for claims 4, 5, 10 rejected as obvious over Meger et al. in view of Moseson and further in view of Oda et al.

In response to the argument that Oda et al. does not suggest biasing the substrate, it is argued that Oda et al. at Column 3 lines 11-14 suggest electrically biasing the substrate where it states that "it is possible to employ a positive or negative DC electric source or an AC electric source as the substrate bias electric power supply 56". (See Oda et al. discussed above)

Response to the arguments for claims 6 and 12 rejected as obvious over Meger et al. in view of Moseson and further in view of Hurwitt et al.

Applicant has argued that there is no motivation to combine Meger and Moseson to rebut the rejection of claims 6 and 12. This argument has previously been addressed by the Examiner above and this response applies here as well.

Response to the arguments for claims 13 and 14 as obvious over Meger in view of Moseson and further in view of Bunshah.

Applicant has argued that there is no motivation to combine Meger and Moseson to rebut the rejection of claims 13and 14. This argument has previously been addressed by the Examiner above and this response applies here as well.

Response to the 37 C.F.R. 1.132 Declaration:

Applicant's 37 CFR 1.132 Declaration shows the amount of ionization as electron energy changes for nitrogen. The declaration points out that the species generated in Applicant's invention are different than the species generated in Moseson's invention. It is silent on what makes the species different but the Examiner presumes that it is related to the magnetic means of Applicant's apparatus. In response it is argued that the primary reference to Meger teach utilizing a magnetic means to form a large plasma. As discussed above there is motivation to combine Meger with Moseson because Moseson establish that a sputtering target or source is utilizable in an apparatus where an electron beam is used to generate a plasma for performing a sputtering process and will produce quality films. Furthermore, Meger et al. teach an electron beam for generating the plasma and suggest utilizing the ***"plasma for processing applications"***. Therefore when considering the teachings of Moseson in which a sputtering ***"process"*** is performed it would be obvious to one of ordinary skill in the art to modify Meger et al. by placing a sputtering target in Meger et al.'s apparatus since ***"processing"*** is what is required to take place in their apparatus. (See Meger et al. and Moseson discussed above) Furthermore, Meger suggest the phrase ***"plasma for processing applications"*** and that is construable to include sputtering and other methods (i.e. etching) and is a term of art construed to include numerous processing

embodiments. Further evidence that ***"plasma for processing applications"*** is a term of art is readily available in Handbooks such as "Handbook of Deposition Technologies for Films and Coatings" from Noyes Publications which mentions that ***"processing plasma is a plasma that is used in materials processing"*** and that such ***"plasmas for processing"*** are used in sputtering. Furthermore, Manheimer et al. suggest large area plasma can be used for deposition and deposition includes sputtering. (See Moseson, Meger et al. and Manheimer et al. discussed above)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795

RM
February 12, 2009